

**WHAT IS CLAIMED IS:**

1. A fuel reforming apparatus comprising:

a reforming catalyst that reforms raw gas including hydrocarbon fuel into reformed gas including hydrogen; and

5 a filtering member comprised of an interstitial material including a plurality of gaps having a diameter equal to or smaller than a selected effective diameter, that carries the reforming catalyst on at least one face of the filtering member, and that reforms the raw gas into the reformed gas while filtering the raw gas.

2. The fuel reforming apparatus according to claim 1, further comprising:

10 a raw material supply flow passage that causes the raw gas to flow along a first face of the filtering member and that supplies the raw gas to the filtering member; and

15 a processed gas flow passage that causes reformed and filtered gas to flow along a second face of the filtering member.

3. The fuel reforming apparatus according to claim 2, wherein:

the raw material supply flow passage causes the raw gas to flow along the first face of the filtering member and substantially parallel thereto, and

the processed gas flow passage causes the reformed and filtered gas to flow along the second face of the filtering member and substantially parallel thereto.

20 4. The fuel reforming apparatus according to claim 3, wherein the raw material supply flow passage, the filtering member and the processed gas flow passage are constructed using a monolithic carrier made from the interstitial material.

5. The fuel reforming apparatus according to claim 4, wherein the reforming catalyst is carried by the filtering member on the second face on the side of the processed gas flow passage.

25 6. The fuel reforming apparatus according to claim 5, wherein the first face of the filtering member on the side of the raw material supply flow passage is inactivated.

30 7. The fuel reforming apparatus according to claim 4, wherein the interstitial material forming the filtering member is formed from one of a porous material, a mesh material, a foamed material, non-woven fabric, and a sintered material.

8. The fuel reforming apparatus according to claim 2, wherein the reforming catalyst is carried by the filtering member on the second face on the side of the processed gas flow passage.

9. The fuel reforming apparatus according to claim 8, wherein the first 5 face of the filtering member on the side of the raw material supply flow passage is inactivated.

10. The fuel reforming apparatus according to claim 9, wherein the first face of the filtering member on the side of the raw material supply flow passage is inactivated using alumina.

10 11. The fuel reforming apparatus according to claim 8, further comprising: a partial oxidation catalyst that partially oxidizes the hydrocarbon fuel, wherein the partial oxidation catalyst is carried by the filtering member on the first face on the side of the raw material supply flow passage.

15 12. The fuel reforming apparatus according to claim 8, wherein the reforming catalyst is additionally carried by the filtering member also on the first face on the side of the raw material supply flow passage.

13. The fuel reforming apparatus according to claim 8, wherein the reforming catalyst is additionally carried by the filtering member also on the entire surfaces of the gaps.

20 14. The fuel reforming apparatus according to claim 2, wherein the selected effective diameter of the plurality of the gaps of the interstitial material forming the filtering member has such a dimension that soot that is generated in the raw gas due to the hydrocarbon fuel can be trapped by the filtering member.

25 15. The fuel reforming apparatus according to claim 14, wherein the predetermined effective diameter is from about 10 to about 100 microns.

16. The fuel reforming apparatus according to claim 2, wherein the interstitial material forming the filtering member is formed from one of a porous material, a mesh material, a foamed material, non-woven fabric, and a sintered material.

30 17. The fuel reforming apparatus according to claim 1, wherein the selected effective diameter of the plurality of the gaps of the interstitial material forming the filtering member has such a dimension that soot that is generated in the raw gas due to the hydrocarbon fuel can be trapped by the filtering member.

18. The fuel reforming apparatus according to claim 14, wherein the selected predetermined effective diameter is from about 10 to about 100 microns.

19. The fuel reforming apparatus according to claim 1, further comprising:  
a raw material preparing portion that gasifies hydrocarbon fuel and that  
5 mixes air with water vapors to prepare raw gas,

wherein the raw material preparing portion can increase an amount of air by a predetermined amount with respect to raw gas.

10 20. The fuel reforming apparatus according to claim 1, wherein the porous material forming the filtering member is formed from one of a porous material, a mesh material, a foamed material, non-woven fabric, and a sintered material.

21. A fuel reforming apparatus comprising:  
reforming means for reforming raw gas including hydrocarbon fuel into reformed gas including hydrogen using a reforming catalyst; and  
soot trapping means for trapping soot generated in the raw gas.

15 22. The fuel reforming apparatus according to claim 21, wherein the soot trapping means comprises a filtering member that comprises interstitial material including a plurality of gaps having a diameter equal to or smaller than a selected effective diameter and that filters the raw gas.

20 23. The fuel reforming apparatus according to claim 22, wherein the reforming catalyst is carried by the filtering member on at least one face thereof.

24. The fuel reforming apparatus according to claim 22, further comprising soot removing means for removing soot that has been trapped by the soot trapping means.

25 25. The fuel reforming apparatus according to claim 21, further comprising soot removing means for removing soot that has been trapped by the soot trapping means.

26. The fuel reforming apparatus according to claim 22, wherein the soot removing means contacts soot that has been trapped by the soot trapping means with oxygen-containing gas.

30 27. A method of reforming fuel, comprising:  
gasifying hydrocarbon fuel and mixing air with water vapor to prepare raw gas;

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filtering the raw gas using a filtering member that comprises an interstitial material including a plurality of gaps having a diameter equal to or smaller than a selected effective diameter; and

5 reforming the raw gas during filtration by the filtering member using a reforming catalyst that is carried by the filtering member on at least one face thereof, and producing reformed gas.

28. The method according to claim 27, further comprising trapping soot generated in the raw gas by a plurality of gaps that are formed in the interstitial material forming the filtering member and that have a selected effective diameter.

10 29. The method according to claim 28, further comprising increasing an amount of air by a selected amount with respect to the raw gas when hydrocarbon fuel is gasified and air is mixed with water vapors to prepare raw gas.

30. The method according to claim 29, further comprising increasing the amount of air by a selected amount at intervals of a selected period of time.